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ABSTRACT

This paper considers the implications of four theories from the literature on instruction and describes a model for teaching critical thinking to students in grades five to eight that incorporates these theories. The theories discussed are that intellectual skills represent a more meaningful instructional goal than knowledge of content; that skill training should be supplemented with deliberate instruction designed to alter the cognitive strategies, styles and dispositions of the learner; that problem-solving competence is the most meaningful behavioral objective of instruction and can be taught in a cognitive curriculum divorced from traditional subject matter areas; and that instructional material should be developed that teaches children operations and strategies for dealing with the complex problems and decisions they face in their out-of-school hours. The development of the programed instruction teaching model is outlined and instructional materials are described. The learning objectives of the five units that make up the model are presented along with a method for collecting evaluation data. (AEA)

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A DESIGN FOR TEACHING CRITICAL THINKING USING PROGRAMMED INSTRUCTION

RBS Publication No. BI-3

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Humanizing Learning Program
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Over the course of the last 20 years there has been a shift in opinion with respect to the improvement of curriculum. Prescriptions for the reform of traditional subject matter areas have been replaced by demands for innovative programs in areas such as creativity, value clarification, consumer awareness and career education. Traditional approaches to instruction have been criticized in favor of process education, discovery methods, inquiry approaches and humanistic education.

Accompanying the demands for innovation in both classroom content and process has been a pervasive concern for the specification of behavioral outcomes relative to any course of instruction. As a result of this professed need for both structure and diversity, instructional psychologists have come to address themselves to redefining the goals of education. This paper will consider the implications of four "maxims" from the literature on instruction and describe a model for teaching critical thinking which incorporates these maxims.

The writings of Gagne (e.g., 1970) lend evidence to the judgment that intellectual skills represent a more meaningful instructional goal than knowledge of content. Learning, which is defined as a change in underlying

student capabilities, should be both cumulative and hierarchical according to Gagne such that students become proficient at the higher-level rule-using and problem-solving activities of a discipline. The development or improvement of a curriculum in a given subject matter begins by asking the question: "What is it that you want the learner to be able to do when instruction is completed?" Armed with the answer(s) to this question, you would want to ask the further question: "What prerequisite capabilities must be learned in order to insure competent performance on the criterion task(s)?" AAA's Science - A Process Approach (Livermore, 1964) is an example of a curriculum that was developed in this fashion. Rather than setting out to teach the facts, discoveries and accomplishments of science, the developers, representatives of the domains of scientific inquiry, prepared exercises for students which reflected the kinds of tasks and operations practitioners typically engage in. Students in kindergarten through 6th grade were given materials and activities designed to develop their skills at using the processes of science with the intention that this skill-based instruction would result in competence that would generalize to varieties of content and problems.

Implicit in Gagne's model is the recommendation that, for maximum retention

and transfer-of-training, the learning hierarchy design might well be applied to any and all subject matter areas where "process," not content, would become emphasized. Bruner (1960, 1966) takes the prescription for skill instruction one step further in advocating that students come to learn the structure of a discipline by learning the processes and operations of its practitioners at the same time as they come to understand the more abstract concepts and principles that organize the discipline. Bruner also argues that skill training should have as its principal goal the facilitation of autonomous competence relative to these skills, an objective that can best be met, according to Bruner, by presenting a subject matter in such a provocative fashion that intellectual mastery becomes intrinsically rewarding. Furthermore, Bruner maintains that transfer-of-training be thought of as an activity that students should engage in frequently and consciously throughout the course of instruction.

Gagne's emphasis upon the conditions for maximizing the learning of skills is tempered in Bruner's writing by a concern for the autonomy of the student. Bruner's maxims for "process education" lead the developer of innovative materials to concern himself with providing motivation and supplementing skill training with deliberate instruction designed to alter the cognitive strategies, styles and dispositions of the learner.

A related instructional goal with respect to the teaching of cognitive skills is best exemplified in the writings of Covington (e.g., 1968). Covington maintains that problem-solving competence is the most meaningful behavioral objective of instruction and argues further that problem-solving can be taught in the form of a cognitive curriculum divorced from traditional subject matter areas. Those generalizable, analytical, synthetic and evaluative skills and strategies which would form the core of this curriculum would be applicable to wide areas of inquiry. Covington and the other authors of the Productive Thinking Program believe that the acquisition of good thinking habits will not only result in the improvement of children's problem-solving performance but will also have a salutary effect on their self-confidence with respect to their abilities.

The trend towards relevancy and the humanization of the curriculum is partially based on the realization that the objectives of instruction are often inconsistent with the demands of extra-school tasks. Kohlberg (1968), Rohwer (1971), Rubin (1969) and others suggest that instructional objectives be continuous with respect to the skills that will have "payoff" in later years. Taken in conjunction with the above prescriptions, this maxim seems to point to the need for the development of instructional material that teaches children operations and strategies for dealing with the complex problems and decisions

they continually face in their out of school hours.

Critical thinking, like creative thinking, is a rubric that means all things to all people. Except when it is defined as training in syllogistic and conditional reasoning, it is usually thought of as a very general evaluative process involving the identification of persuasive techniques or fallacies in reasoning and it is most often introduced into a social studies or literature curriculum in order to show students the myriad uses of language. Rarely is the concept of "skill" taken seriously by developers of critical thinking material. Insofar as critical thinking can be defined as rule-governed behavior, it should be possible to use the instructional recommendations above to design a skill-based, problem-solving program that involves students in making independent and deliberate choices on "real-life" tasks. Accordingly, in 1971-1972, the Humanizing Learning Program of Research for Better Schools, Inc., undertook to develop a model for such a program.

Despite the availability of a score of articles concerning teaching critical thinking, adherence to the maxims presented above resulted in the rejection of models offered by previous investigators and developers. These models tended to emphasize logical fallacies, diversion in argumentation, logical operators (words like all, some, if and then), inferences or the scientific method. Taken alone,

these models seemed too molecular and taken together they seemed to lack integration. Inasmuch as the value associated with a set of intellectual skills resides in their utility for dealing with meaningful problems, the decision was made to imbed instruction in critical thinking skills within the context of distinct problem-solving paradigms involving specific societal roles and popular areas of human experience.

Critical thinking was operationally defined as the use of logical or pragmatic criteria for assessing the reliability, relevancy, sufficiency, validity or meaning of information and the use of evaluative strategies for making complex decisions or for solving problems. The type of information that is most amenable to this kind of critical analysis involves assertions that have a valence attached to them, as in the case of a value judgment, an opinion, an empirical claim, an explanation, a hypothesis or a proposal for action.

The content areas of the program were identified by asking the question: "What well-known occupations involve the evaluation of information so consistently that rules or conventions have been set up to facilitate the task?" The following five content vehicles were selected: Courts, Newspapers, Advertising, Public Health and Societal Conflict. Specifically, a role-model approach to instruction within each of these vehicles was employed such that the learner would become involved in the problem-solving ventures conducted by: a) the trial lawyer

charged with assessing the reliability and admissability of evidence and testimony; b) the newspaper reporter whose job is to collect and evaluate fact and opinion relevant to news stories and editorial proposals; c) the consumer-advocate whose role places him in a position of assessing conclusions rather than data and who must deal with a variety of logical and pragmatic standards for evaluating claims; d) the public health investigator whose detective-like role involves piecing together available facts, generating and testing hypotheses, finding medical or social causes for phenomena and, finally, deciding upon effective treatment; and e) the counselor of ethical or interpersonal conflicts whose effectiveness depends upon his ability to identify the pragmatic or value-laden standards that complicate an argument or decision-making dilemma.

Before elaborating upon the kinds of objectives that make up these vehicles or units, it should be useful to relate what has been said so far to the present program by giving a brief description of the materials. The Making Judgments Curriculum is composed of 30 programmed lesson booklets and five games or simulation activities divided among the units. The lessons are self-pacing and self-administering. They are designed for middle-school-age children in grades 5 - 8 and should eventually constitute a supplementary program to the ongoing curriculum. The lessons are based on approximately 100 operational

objectives arranged to provide a cumulative learning experience within and across the lessons of each unit. In general, units begin by having students make simple discriminations and culminate in learner directed problem-solving activities. This design is accomplished by establishing a balance within each unit of linearly-programmed booklets in combination with booklets that present simulation problems using a branching format and group games or simulations. The simulation booklets, called process lessons, have three major functions: they teach problem-solving or problem-clarification strategies designed to facilitate efficiency in dealing with a wealth of information; they provide an opportunity to apply previously presented rules in an integrated fashion towards some solution in the context of a life-like task, and they function as an important motivational device, offering the student the chance to take control of his own learning and to think for himself.

Motivation is provided for through the use of the role-model approach described above, through varying the content and format within each unit, by presenting provocative questions and illustrations, by providing immediate instructive feedback, by designing the storylines and episodes around topics of interest to the learner and by giving the learner frequent opportunities to take control of his own inquiries. Transfer of training is explicitly

encouraged within each unit and student to student interaction in problem-solving is provided for by way of the group activities.

The basic objectives of Unit I, entitled "Conflict," cluster around the distinction between fact and opinion, between biased and unbiased opinions, between warranted and unwarranted generalizations and between value judgments and empirical judgments. Practice on these discriminations is followed by instruction concerning rules for settling varieties of arguments. Consider the following four statements as argumentative assertions: Number 1. Bill Walton had the highest field goal percentage in collegiate basketball this year. 2. Bill Walton is more fun to watch than Kareem Abdul Jabbar. 3. Without Bill Walton, UCLA would have had a losing season. 4. Bill Walton is unquestionably the best center in collegiate basketball. With training, students are led to classify these assertions into the following categories: 1) a factual argument, 2) an argument about preferences, 3) an argument involving an opinion and 4) an argument involving a value judgment. Furthermore, the student learns to specify the conditions under which these arguments can be settled: 1) looking up the facts, 2) agreeing to disagree or the suggestion of a compromise, 3) the presentation of facts in support of the opinion and 4) the specification of standards by which the judgment can be evaluated. In addition, the student is led to break down a more

difficult judgmental argument such that the standards that underlie the judgment become clear and the argument can then be converted to an empirically resolvable conflict. Once these higher-order capabilities are mastered, the learner is presented with two complex problems to solve. In one problem, students are responsible for judging which of three cities is best suited to serve as the host city for an international exhibition. The decision demands a careful assessment of practical standards like safety and transportation and the evaluation of biased and unbiased judgments and opinions. The second criterion problem for this unit centers around choosing the most qualified political candidate for a town election, a task that is complicated by the intrusion of ethical considerations and conflicts between general value principles.

The second unit is an attempt to teach rules for evaluating the reliability and admissability of courtroom testimony and evidence. Initially, students are taught to recognize such violations of courtroom procedure as asking a witness to agree to a conclusion. In later lessons, however, the learner has the task of presenting his own case in court. To do this the student must employ strategies for calling witnesses; he must choose proper questions to ask these witnesses, and he must be competent at using a set of rules for reacting to the questions and answers introduced by the prosecution and its witnesses.

In the third unit, "Reporting," a similar format is applied. Students are given practice in evaluating news stories according to such standards as completeness, relevance and objectivity in preparation for lessons that involve the student in making all of the decisions typically made by a professional reporter concerning where to go to collect information, what facts and opinions to include, how to present them, what information must be checked and what editorial opinion might be warranted given these facts.

The "Advertising" unit, though not a course in consumer awareness, does include training in identifying common persuasive devices used by the media. The most important objectives of this unit, however, deal with skills for evaluating empirical claims. For example, students are taught to identify uncontrolled variables in a comparative test of products, to recognize when a demonstration does not support a conclusion, to demonstrate the rule for randomly selecting a sample for a survey and to generate a valid and reliable research design for deciding which of two advertising claims is acceptable.

Finally, the fifth unit, "Causation," provides skill training in an additional component of critical thinking, namely, deductive reasoning. Competent performance on the criterion task in this unit depends upon the students' mastery of skills for generating reasonable hypotheses, evaluating hypotheses against

uncovered facts, testing and revising hypotheses, inferring from data and generating fertile research designs.

Initial testing of the materials suggested the development of teacher-directed supplemental activities in order to provide for active group participation and practice. At present, each of the five units consists of lessons, games, 20 -30 suggested activities for the teacher incorporated in a teacher's manual, as well as pretests and criterion-referenced posttests. Evaluation data will be secured using the posttests, subtests of existing critical thinking tests, student interviews, teacher questionnaires and observation instruments. Preliminary data from a pilot test of one unit was somewhat hopeful. Experimental subjects performed significantly better than controls on a mastery test and on one of the two transfer measures used. In addition, student and teacher enthusiasm has been high in the tryouts and anecdotal evidence has provided some support for the hypothesis that students will find these skills relevant and useful in other curriculum areas.

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